

AMENDMENTS TO THE CLAIMS

This Listing of claims will replace all prior versions, and listings of claims in the application:

Claim 1 (canceled)

Claim 2 (canceled)

Claim 3 (previously presented): A method of customizing a polishing pad for chemical mechanical planarization of a substrate, the method comprising:

obtaining one or more characteristics of a structure on the substrate; and

selecting a value for one or more chemical or physical properties for the pad to be used in chemical mechanical planarization of the substrate based on the obtained one or more characteristics of the structures on the substrate

wherein selecting the value for one or more chemical or physical properties for a pad comprises:

performing a simulation of planarization of the substrate with a model of a CMP process using the pad with a range of values for the one or more chemical or physical properties of the pad; and

selecting the value for the one or more chemical or physical properties based on the simulation, and wherein the one or more characteristics of the structure includes a pattern density of the structure.

Claim 4 (previously presented): A method of customizing a polishing pad for chemical mechanical planarization of a substrate, the method comprising:

obtaining one or more characteristics of a structure on the substrate; and

selecting a value for one or more chemical or physical properties for the pad to be used in chemical mechanical planarization of the substrate based on the obtained one or more characteristics of the structures on the substrate

wherein selecting the value for one or more chemical or physical properties for a pad comprises:

performing a simulation of planarization of the substrate with a model of a CMP process using the pad with a range of values for the one or more chemical or physical properties of the pad; and

selecting the value for the one or more chemical or physical properties based on the simulation, and wherein the one or more characteristics of the structure includes film material and a number of different materials.

Claim 5 (previously presented): A method of customizing a polishing pad for chemical mechanical planarization of a substrate, the method comprising:

obtaining one or more characteristics of a structure on the substrate; and

selecting a value for one or more chemical or physical properties for the pad to be used in chemical mechanical planarization of the substrate based on the obtained one or more characteristics of the structures on the substrate

wherein selecting the value for one or more chemical or physical properties for a pad comprises:

performing a simulation of planarization of the substrate with a model of a CMP process using the pad with a range of values for the one or more chemical or physical properties of the pad; and

selecting the value for the one or more chemical or physical properties based on the simulation, and wherein the one or more chemical or physical properties for the pad includes hardness, thickness, surface grooving, porosity, Youngs modulus, compressibility, or asperity of the pad.

Claim 6 (canceled)

Claim 7 (previously presented): A method of customizing a polishing pad for chemical mechanical planarization of a substrate, the method comprising:

obtaining one or more characteristics of a structure on the substrate; and

selecting a value for one or more chemical or physical properties for the pad to be used in chemical mechanical planarization of the substrate based on the obtained one or more characteristics of the structures on the substrate

wherein selecting the value for one or more chemical or physical properties for a pad comprises:

performing a simulation of planarization of the substrate with a model of a CMP process using the pad with a range of values for the one or more chemical or physical properties of the pad; and

selecting the value for the one or more chemical or physical properties based on the simulation, and further comprising:

providing a pattern density and a deposition bias as inputs to the model of the CMP process.

Claim 8 (previously presented): A method of customizing a polishing pad for chemical mechanical planarization of a substrate, the method comprising:

obtaining one or more characteristics of a structure on the substrate; and

selecting a value for one or more chemical or physical properties for the pad to be used in chemical mechanical planarization of the substrate based on the obtained one or more characteristics of the structures on the substrate

wherein selecting the value for one or more chemical or physical properties for a pad comprises:

performing a simulation of planarization of the substrate with a model of a CMP process
using the pad with a range of values for the one or more chemical or physical properties of the pad;
and

selecting the value for the one or more chemical or physical properties based on the simulation, and further comprising:

obtaining a planarization length from the model of the CMP process; and
performing a sensitivity analysis to determine a correlation between the planarization length and the one or more chemical or physical properties of the pad.

Claim 9 (previously presented): The method of claim 8, wherein the value for the one or more chemical or physical properties of the pad is selected based on the determined correlation between the planarization length and the one or more chemical or physical properties of the pad to optimize the planarization length.

Claim 10 (previously presented): A method of customizing a polishing pad for chemical mechanical planarization of a substrate, the method comprising:

obtaining one or more characteristics of a structure on the substrate; and
selecting a value for one or more chemical or physical properties for the pad to be used in chemical mechanical planarization of the substrate based on the obtained one or more characteristics of the structures on the substrate

wherein selecting the value for one or more chemical or physical properties for a pad comprises:

performing a simulation of planarization of the substrate with a model of a CMP process using the pad with a range of values for the one or more chemical or physical properties of the pad; and

selecting the value for the one or more chemical or physical properties based on the simulation, and further comprising:

identifying dishing and/or erosion from the model of the CMP process; and

performing a sensitivity analysis to determine a correlation between the one or more chemical or physical properties of the pad and dishing and/or erosion.

Claim 11 (previously presented): The method of claim 10, wherein the value for the one or more chemical or physical properties of the pad is selected based on the determined correlation between the one or more chemical or physical properties of the pad and the dishing and/or erosion to reduce the dishing and/or erosion.

Claim 12 (previously presented): A method of customizing a polishing pad for chemical mechanical planarization of a substrate, the method comprising:

obtaining one or more characteristics of a structure on the substrate; and

selecting a value for one or more chemical or physical properties for the pad to be used in chemical mechanical planarization of the substrate based on the obtained one or more characteristics of the structures on the substrate

wherein selecting the value for one or more chemical or physical properties for a pad comprises:

performing a simulation of planarization of the substrate with a model of a CMP process using the pad with a range of values for the one or more chemical or physical properties of the pad; and

selecting the value for the one or more chemical or physical properties based on the simulation, and further comprising:

identifying over-polishing and/or under-polishing from the model of the CMP process; and performing a sensitivity analysis to determine a correlation between the one or more chemical or physical properties of the pad and over-polishing and/or under-polishing.

Claim 13 (previously presented): The method of claim 12, wherein the value for the one or more chemical or physical properties of the pad is selected based on the determined correlation between the one or more chemical or physical properties of the pad and the over-polishing and/or under-polishing to reduce the over-polishing and/or under-polishing.

Claim 14 (previously presented): A method of customizing a polishing pad for chemical mechanical planarization of a substrate, the method comprising:

obtaining one or more characteristics of a structure on the substrate; and selecting a value for one or more chemical or physical properties for the pad to be used in chemical mechanical planarization of the substrate based on the obtained one or more characteristics of the structures on the substrate

wherein selecting the value for one or more chemical or physical properties for a pad comprises:

performing a simulation of planarization of the substrate with a model of a CMP process using the pad with a range of values for the one or more chemical or physical properties of the pad; and

selecting the value for the one or more chemical or physical properties based on the simulation, and wherein the structure is an optoelectronic device.

Claim 15 (canceled)

Claim 16 (canceled)

Claim 17 (previously presented): A method of customizing a polishing pad for chemical mechanical planarization of a semiconductor wafer, the method comprising:

- obtaining one or more characteristics of a chip;
- performing a simulation of a chemical mechanical planarization of the wafer with a model of a CMP process using the obtained one or more characteristics of the chip and a range of values for the one or more chemical or physical properties of the pad; and
- selecting a value for one or more chemical or physical properties for the pad based on the simulation, wherein the one or more characteristics of the chip includes a pattern density of the chip.

Claim 18 (previously presented): The method of claim 17, wherein the one or more chemical or physical properties for the pad includes hardness, thickness, surface grooving, porosity, Youngs modulus, compressibility, or asperity of the pad.

Claim 19 (previously presented): A method of customizing a polishing pad for chemical mechanical planarization of a semiconductor wafer, the method comprising:

- obtaining one or more characteristics of a chip;

performing a simulation of a chemical mechanical planarization of the wafer with a model of a CMP process using the obtained one or more characteristics of the chip and a range of values for the one or more chemical or physical properties of the pad; and

selecting a value for one or more chemical or physical properties for the pad based on the simulation, and further comprising:

obtaining a planarization length from the model of the CMP process; and

performing a sensitivity analysis to determine a correlation between the planarization length and the one or more chemical or physical properties of the pad.

Claim 20 (previously presented): The method of claim 19, wherein the value for the one or more chemical or physical properties of the pad is selected based on the determined correlation between the planarization length and the one or more chemical or physical properties of the pad to optimize the planarization length.

Claim 21 (previously presented): A method of customizing a polishing pad for chemical mechanical planarization of a semiconductor wafer, the method comprising:

obtaining one or more characteristics of a chip;

performing a simulation of a chemical mechanical planarization of the wafer with a model of a CMP process using the obtained one or more characteristics of the chip and a range of values for the one or more chemical or physical properties of the pad; and

selecting a value for one or more chemical or physical properties for the pad based on the simulation, and further comprising:

identifying dishing and/or erosion from the model of the CMP process; and

performing a sensitivity analysis to determine a correlation between the one or more chemical or physical properties of the pad and the dishing and/or erosion.

Claim 22 (previously presented): The method of claim 21, wherein the value for the one or more chemical or physical properties of the pad is selected based on the determined correlation between the one or more chemical or physical properties of the pad and the dishing and/or erosion to reduce the dishing and/or erosion.

Claim 23 (previously presented): A method of customizing a polishing pad for chemical mechanical planarization of a semiconductor wafer, the method comprising:

- obtaining one or more characteristics of a chip;

- performing a simulation of a chemical mechanical planarization of the wafer with a model of a CMP process using the obtained one or more characteristics of the chip and a range of values for the one or more chemical or physical properties of the pad; and

- selecting a value for one or more chemical or physical properties for the pad based on the simulation, and further comprising:

- identifying over-polishing and/or under-polishing from the model of the CMP process; and

- performing a sensitivity analysis to determine a correlation between the one or more chemical or physical properties of the pad and the over-polishing and/or under-polishing.

Claim 24 (previously presented): The method of claim 23, wherein the value for the one or more chemical or physical properties of the pad is selected based on the determined correlation between the one or more chemical or physical properties of the pad and the over-polishing and/or under-polishing to reduce the over-polishing and/or under-polishing.

Claim 25 (currently amended): A method of ~~making~~ ~~customizing~~ a pad used in chemical mechanical polishing (CMP) to planarize a metal or dielectric film comprising:

selecting a value for one or more chemical or physical properties of the pad to compensate for pattern density effects of different chip or substrate architectures

[[and]] optimizing the pad for a derived planarization length, response characteristics for dishing and/or erosion, or final step height at specific pattern features to attain local and global planarization of the chip or substrate and

forming the pad based on said value and after said optimizing.

Claim 26 (previously presented): The method of claim 25, wherein the optimization is performed for planarization of a silicon integrated circuit.

Claim 27 (previously presented): The method of claim 25, wherein the optimization is performed for planarization of an optoelectronic device.

Claim 28 (previously presented): The method of claim 25, wherein the optimization is performed for planarization of a magnetic or optical disk.

Claim 29 (previously presented): The method of claim 25, wherein the optimization is performed for planarization of a film on a ceramic or nano-composite substrate.

Claim 30-31 (canceled).